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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/030,867	04/29/2002	Masanori Kimura	81839.0105	8937
26021	7590	12/02/2003	EXAMINER	
HOGAN & HARTSON L.L.P.			ANDERSON, MATTHEW A	
500 S. GRAND AVENUE			ART UNIT	PAPER NUMBER
SUITE 1900			1765	
LOS ANGELES, CA 90071-2611			DATE MAILED: 12/02/2003	

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/030,867	KIMURA, MASANORI	
	<b>Examiner</b>	<b>Art Unit</b>	
	Matthew A. Anderson	1765	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 15 September 2003.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-5 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-5 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 April 2002 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. §§ 119 and 120**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☒ All   b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.  
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                  | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____  |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)         | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____                                    |

**DETAILED ACTION**

***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kijima et al. (US 6,458,202 B1).

Kijima et al. discloses a Cz method of pulling a single crystal silicon ingot having a uniform thermal history. (see abstract) The power supplied to the side heater is maintained constant throughout the growth of the main body and end cone of the ingot. The power supplied to the bottom heater is gradually increased during the second half of the growth process. The number of defects in the ingots is decreased versus the conventional process. In col. 10 lines 15-35 it is relayed that the bottom heater is used after about 40%-60% or more of the main body has formed. The cooling rate is described as less than 5% variable in the main body of the ingot. In col. 6 lines 5-25 (see also Fig. 1A) the basics of Cz pulling are described including a crucible charged with raw material, a surrounding side heater, and a pulling shaft or wire for withdrawal of

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the seed crystal from the melt to form the ingot. A steel container encloses the apparatus. Bottom heaters are also provided.

Kojima does not describe utilization percentage of the bottom heater in term of weight of the ingot withdrawn versus the original raw material weight.

In respect to claim 1, it would have been obvious to one of ordinary skill in the art at the time of the present invention, however, to grow such a Si ingot using a bottom heater powered after 60% (by weight ) of the Si ingot has been grown because Kojima suggest using bottom heating after 60% (by length) of the Si ingot is grown and the length and weight of Si were known to be directly related. From elementary definitions of density and from geometry of a cylindrical ingot:

$$(L \cdot A) \cdot D = W$$

where:	L	=	ingot length
	A	=	ingot cross-sectional area
	D	=	Si density (constant at constant growth temperature)
	W	=	Si ingot weight

In respect to claim 2, it would have been obvious to one of ordinary skill in the art at the time of the present invention to keep the thermal gradients constant (i.e. uniform) in the ingot throughout all stages of the growth because Kojima et al. specifically suggests this in the first line of the abstract.

In respect to claims 3 and 4, it would have been obvious to one of ordinary skill in the art at the time of the present invention to optimize the power values of the main heater and the bottom heater and to control these power values during the growth because Kojima suggest control of the heaters (Col. 13 line 25-35) and optimization of the power sent to the heaters due to operational parameters including the hot zone design (col. 13 lines 40-55).

3. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kojima et al. as applied to claims 1-4 above above, and further in view of Ito JP01040668.

Kojima et al. is described above.

Heating of the raw material between pulling cycles is not detailed.

Ito et al. discloses a method for growing a semiconductor single crystal by the Czochralski (Cz hereafter) pulling method. A quartz crucible is filled with raw material and heated to form a melt. Side heaters (3) and bottom heaters (4) are used in the heating process. A seed crystal is then contacted with the melt and slowly pulled up to from a single crystal ingot. A chamber (1) surrounds the crucible and heaters. The raw material is rapidly and effectively melted (abstract) by increasing the temperature uniformly across the crucible (Fig. 3 graph where the circles are the present invention).

It would have been obvious to one of ordinary skill in the art at the time of the present invention to combine the raw material melting use of the bottom heater (Ito) with the growth use of the bottom heater (Kojima) because then turnaround time between

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uses of the apparatus will be reduced and more product can be made. It suggests the bottom heater allows rapid and effective raw material melting.

In respect to claim 5, it would have been obvious to one of ordinary skill in the art at the time of the present invention to not allow solidification of the remaining melt between batch cycles because this would require additional heat and time to be used in re-melting the remaining raw material along with the new raw material added to the crucible for the next batch cycle.

### ***Response to Arguments***

4. Applicant's arguments with respect to claims 1-5 have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew A. Anderson whose telephone number is (703) 308-0087. The examiner can normally be reached on M-Th, 7:30-6.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (703) 305-2667. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

MAA

November 20, 2003

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